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ABSTRACT

This paper reviews literature on the effectiveness of computer-assisted instruction (CAI) and reports on the results of a survey of teachers' opinions of CAI. The literature review indicates that CAI exerts small but positive effects on learning but is not a miracle cure, and more evaluation of it is needed. A survey was conducted of 30 teachers who use CAI in the Chicago (Illinois) Public Schools. According to the findings, teachers felt that CAI should begin as early as kindergarten and that CAI prepares students for the world of work, but they felt that CAI basically involves learning how to play games on the computer and students will become bored with it. Teachers disagreed with statements that CAI was better than traditional teaching, that students are more motivated by computers than by teachers, that drill and practice diminishes the students' ability to learn how to learn, and that CAI denies students the opportunity to theorize and reason. The majority of the teachers felt that CAI enhanced student achievement and enabled children to pace their own learning. The paper concludes that teachers are mixed on their acceptance of CAI as it relates to their own needs and as an enhancement to their students' achievement. (Contains 14 references.) (JDD)

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TEACHERS' OPINION OF COMPUTER-ASSISTED-INSTRUCTION (CAI)

BY: Shirley Ann Berry

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TEACHERS OPINION
OF
COMPUTER ASSISTED INSTRUCITON (CAI)

Shirley Ann Berry

In the Chicago Public School System, some school principals and local school councils have utilized State and Federal Chapter I funds to purchase computers and computer software to enhance student achievement. Some use the pullout instruction approach, allowing students to leave their regular classrooms to work in special rooms that provide supplementary instruction, educational equipment, and materials. These programs are called Computer-Assisted-Instruction (CAI), defined as instructional computing applications involving conventional educational methods used in pursuit of traditional educational goals. This approach targets those students who can benefit from instruction within the regular classroom setting, but who need additional supportive help. In addition, many students use computers and computer software sometime during the school year, either to learn about computers or as a tool for learning other subjects.

Research maintains that certain drill and practice programs have been shown to exert a small but positive effect on learning. In some schools, these programs, commonly call Computer-Assisted-Instruction (CAI), use these integrated learning systems (individualized academic tutorials) especially in the early years and among under-achieving urban populations. Research states that in an urban elementary school with an outstanding CAI program, students in grades K-5 averaged a full grade above the norm on the Iowa Test of Basic Skills (Educational Leadership, 1994).

Given the available technology, educators could benefit if they knew the effectiveness of CAI as compared to traditional methods on academic achievement so that results could be reported to teachers to better serve students. The results may confirm to teachers that computer technology is a viable tool of instruction in the future. The question, then, is whether the achievement of the student is enhanced by his exposure to computer assisted instruction (CAI).

Literature on the differential effectiveness of CAI and the traditional methods of teaching is still not conclusive. The computer has great advantages over any device previously introduced in the classroom to assist the teaching-learning process. It is highly attractive to children, versatile, aids in discipline, and helps teachers to find new ways to help children learn. Although few programs are available to help teachers understand children or to help administrators cope with labor problems, the potential exists in a viable form. Hopefully, educators will accept the challenge posed by this most versatile educational tool.

Humankind has passed a number of milestones. Each resulted in a "system-break" - a profound change in the way people lived, thereafter. One milestone was reached when humans began to recognize that they were creatures who could think, who became aware of their existence - of their humanity. Another milestone was the development of agriculture, a system-break that permitted nomadic hunters to become farmers whose lives had greater stability and whose produce permitted the rise of cities in ancient times. The concept of God also led to indelible changes in the ways in which our forebears ordered their lives. The development of writing likewise was a potent creation, promoting access to knowledge (Teaching and Learning in a Microelectronics Age, 1987)

In the past 600 years, major changes have occurred with increasing rapidity. Among them were the Renaissance, the printing press, and the Industrial Revolution. Recent milestones includes inventions such as the radio, TV, hi-fi, motion pictures, typewriters, and the telegraph (Understanding Media: The Extension of Man, 1964).

During the 1980's, personal computers became widespread at all levels of schooling. This decade saw the number of computers used in the United States elementary and secondary schools increase from under 100,000 to over 2.5 million. Students now use computers and computer software sometime during the school year either to learn about computers or as a tool for learning other subjects (Grolier Electronic Publishing, Inc. 1993). This concept, as defined by Riedesel and Clements (1985) is called computer assisted instruction (CAI), a teaching process directly involving the computer in presentation of instructional material in an interactive mode to provide and control the individualized learning environment for each individualized student. Those interactive modes are usually subdivided into drill and practice, tutorial, simulation and gaming, and problem solving. They surveyed approximately 1,000 schools and found drill and practice materials often lend themselves to instructional games. They performed two studies regarding the Level of Acceptance and Utilization; the first in 1977 found that CAI was widely dispersed but emerging in Acceptance and heavy in basic skills in Utilization. By 1990, Acceptance was widespread and Utilization was universal for skill development and high level concept development.

The term Computer-Assisted Instruction has been used in a variety of ways by those concerned with educational computing. Some have applied it only to the first generation of educational computing materials that emerged in the sixties: large-scale drill and practice and tutorial programs. Others apply it to any educational use of computers. In this discussion, CAI falls somewhere in the middle. CAI refers to instructional computing applications involving conventional educational methods used in pursuit of traditional educational goals. The computer is an electronic aid to teachers, and CAI programs are the teachers' instructional materials, in which are embedded their teaching methods (Computers In Education, 1985).

Some critics see computer education as the latest in a series of unsuccessful attempts to change education through the use of audio and visually-oriented nonprint media. These so-called revolutionary techniques were initially lauded for their

instructional potential, but ultimately became minor classroom tools alongside traditional methods (Grolier Electronic Publishing, Inc., 1993). This reference continues to report the belief that computers are a much more powerful learning medium than the others that preceded it. They cite the essential interactive nature of using computers programmed to provoke decision making and the manipulations of visual environments. They think that learning tasks can become more individualized, enabling each student to receive immediate feedback. They also say that having students work collaboratively on computers leads to greater initiative and more autonomous learning. As proponents of CAI, they also argue that because computers are so pervasive in U. S. society, "computer literacy" is a worthy goal.

Studies of the effects of CAI on how well children learn basic skills have, generally, been supportive of CAI, although critics question the quality of much of the research (Beyond the Computer Revolution, 1986). They claim that CAI's effects may be mainly limited to the early grades, to more routine skills, to students from disadvantaged backgrounds, and, most impressively so far, among learning disabled students. Yet, many computer education enthusiasts believe that computers can be used in more innovative ways; they see CAI as a substitute for paper and pencil drills and thus, as weak use of computers. There is, they say, good reasons for the dominance of CAI. Its activities are relatively easy to program; it is compatible with traditional methods of instruction; and it requires relatively little effort to organize and maintain computer use. They add that, because CAI activities can be kept distinct from other classroom learning activities, schools with a limited supply of computers can collect them in centrally based "laboratories". About one-half of school computers nationwide are located in such settings.

Kulik, (1983), Bangert-Downs, (1985), Niemiec and Walberg, (1985 and 1987) and Rockman, (1993) all believed that certain drill-and practice programs have been shown to exert a small but positive effects on learning. They state that, in some schools, computer-assisted-instruction (CAI) using integrated learning systems (Individualized academic tutorials), has shown impressive gains, especially in early years and among under-achieving urban populations. Richey, page 55, reports that in an urban elementary school with an outstanding CAI program, students in grades K-5 averaged a full grade above the norm on the Iowa Test of Basic Skills.

Susan Imel (1992), stated that computer-assisted-instruction (CAI) has become more important to vocational education, that at least 2 million schools now have computers, and by the year 2000, 75 percent of jobs will require computer knowledge. She found through her review of literature about CAI, that in vocational education, the following occurred: (1) though CAI can be effective in vocational education, its superiority over other methods has not been proven; (2) previous computer experience is advantageous in CAI; (3) access and equity are issues associated with CAI; (4) CAI can be a tool for teaching the applications students will use in industry; (5) CAI is an effective tool for delivering competency-based education; and (6) currently, CAI serves in a secondary role in vocational education classrooms. She stated that some guidelines for

effective use of CAI should include 1) all instructional staff be familiarized with CAI; 2) access and equity issues should be addressed; 3) existing curricula should be examined to determine ways to integrate CAI; 4) costs and benefits of CAI should be examined before it is adopted; 5) CAI cannot be the sole source of instructional support; 6) drill and practice programs should be used to provide students with effective learning experiences while allowing teachers to have more time with other students needing extra attention; and 7) the role of CAI in vocational education should be broadened. She determined that more research is needed to determine the effectiveness of microcomputers as a tool in vocational education.

A review of 12 studies comparing computer-assisted (CAI) and traditional instruction in Adult Basic and Secondary Education (ABSE) found that, in 10 of 12, CAI results were at least as good as traditional and CAI also aided retention, self-confidence, privacy, feedback, and faster learning. CAI's place in ABSE is confirmed, but it is not a miracle cure (Rachal, 1984-1992).

In 1992, McWeeney described a computer-assisted-instruction (CAI) program used to teach DOS commands. Pretest and posttest results for 65 graduate students using the program are reported, and it is concluded that the CAI program significantly aided the students. Lowe and Bickel (1993) performed a study to examined whether computer-assisted-instruction (CAI) compared to conventional instruction, would improve the teaching of grammar and writing to college students studying developmental communication. A quasi-experimental pretest/posttest evaluation indicated students receiving CAI enjoyed a substantial advantage in the presence of a fairly broad range of control variables.

Evaluating CAI is and should be a continuous process. Research shows that the verdict is still out and, according to Begona Gros and J. Michael Spector, their evaluation can be summarized as follows:

1. Evaluation is regarded as central to the use of CAI, both in drill and practice programs as well as in tutorial programs.

2. Many different guidelines have been proposed for the evaluation and selection of software.

3. The prevailing methodology used in the evaluation of software in the classroom is based on an experimental paradigm (control group, test, post-test control, etc.).

4. Most evaluations are centered on the program as something not connected with the methodology of the teacher, the context, the curriculum, or the learning culture.

5. The research period is generally quite short, which makes it difficult to establish general conclusions and to modify and improve the quality of the products.

Gros and Spector stated that the review is intended to suggest that many CAI evaluations are incomplete or inadequate in some respect in spite of the perceived importance of evaluation. In addition, they say that their summary suggests that an evaluation could be focused on the use of a specific program, or its specific effects on learning, or its impact on the curriculum, context, and culture. Because of this, they consider it fundamental to recognize the different kinds of evaluation along with implications for methodology. They identified three levels of evaluation and refer to each as follows: A(product-orientated evaluation (focuses on an object of a product); b) user-oriented evaluation (focuses on the user of the product); and c) context-oriented evaluation (focuses on the situation in which the product is used).

Literature on the relationship between CAI and the traditional methods of teaching is still not conclusive. The computer has great advantages over any device previously introduced into the classroom to assist the teaching-learning process. It is highly attractive to children, it is very versatile, it aids classroom discipline, and it enables teachers to gain new insights into the ways children learn. Teachers and administrators, as well as parents, can profit from the teaching-learning capabilities of the computer. Although few programs are available as yet to help teachers understand children or to help administrators cope with labor problems, the potential exists in a viable form. Hopefully, educators will accept the challenge posed by this most versatile educational tool. Therefore, the purpose of this study is to explore what teachers opinions of computer-assisted-instruction (CAI) are.

Procedure

The population/sample in this study will include 30 teachers in the Chicago Public Schools who use CAI in their schools.

The self devised questionnaire, "The Berry Teachers' Opinion of CAI questionnaire", was distributed by researcher to the thirty teachers in the Chicago Public Schools. They were asked to indicate their agreement or disagreement with each statement by circling the corresponding response. The questionnaire was placed in the mail boxes at the researcher's school. ESEA Computer teachers were not included in the study.

Findings of the Study

The data in the Table I show that teachers were somewhat split on the idea that CAI was beneficial to students. In the section of the questionnaire that dealt with Opinions about CAI, teachers agreed generally that CAI should begin as early as kindergarten and that CAI prepares students for the world of work . They then said that CAI is basically learning how to play games on the computer and that it will be short lived as the novelty wears off and students become bored with it.. Some teachers agree that low-aptitude student profit more from the use of CAI than either average or high-aptitude students do, however, the number that felt this way was not significant.

In the section where teachers responded to questions regarding traditional teaching methods versus computer aided instruction, teachers disagreed the majority of the time that computer aided instruction was better. They disagreed fifty-three percent of the time that students are more motivated by computers than by teachers; they said that computer instruction is too much a rote-learning situation, and that computer-based instruction denies students the opportunity to act as teachers, to theorize, to reason with others, and to explain in their own words. They felt sixty percent of the time that educators should avoid using computers only for drill and practice. This, however, seemed contradictory to the other findings as stated above.

The next section of the questionnaire asked the teachers three key questions about their own experience with computers. When asked if they were computer literate, 80% answered positively. When asked if literacy meant that they could turn the computer on or/and off, they said 63% of the time they said that the statement did not denote computer literacy. This mixed response may mean that some teachers only need to use the computer in limited ways and to them this means that they are computer literate. However, teachers who use the computer extensively would not consider a teacher who used the computer in a limited way to be literate.

The final section of the questionnaire probed the teachers about their opinion of whether computer-assisted-instruction (CAI) enhanced student achievement; sixty-three percent agreed; they also agreed that the child can better pace his or her own learning with a computer. However, here too is a mixed response as sixty seven responses were negative when asked if computers are a waste of students' valuable class time.

Overall, the data leads to the acceptance of the null hypothesis: teachers are mixed on their acceptance of CAI as it relates to their own need and as an enhancement to achievement to their students.

In this study, more research is necessary about how teachers feel about CAI and computers. When teachers are confronted, probably, during the 21st century, with the challenge of the "information highway" with their own growth and destiny, they will rise, as they have in the past, to a level of competency that will assure their survival as professionals. Also, with the advent of the PC (personal computer) and the expectation that as many households that have telephones will have computers, the professionals will be as literate with the computer as they are with the telephone. This study may have had a different result if the researcher had had more control on the method of data collection and the population had been significantly larger, thereby, allowing more control of the extraneous variables.

Table 1

Berrys Teacher's Opinion of CAI Questionnaire

Teacher Responses (%)

(N = 30)

Question	Agree	Dis-agree	Don't know
1. Are you computer literate.	80*	10	10
2. Students should begin CAI in kindergarten.	57*	33	10
3. Students are more motivated by computers than by teachers.	30	53*	17
4. School children in poor minority communities will probably benefit more from CAI.	30	43	27
5. Computer literate means the ability to turn a computer on and off.	20	63*	17
6. CAI prepares students for the world of work.	70*	13	17
7. All teachers should be computer literate.	63*	30	7
8. Computers increases students achievement.	63*	20	17
9. Games give an immediate sense of the computer's friendliness.	53	37	10
10. Drill-and-practice diminishes the students's ability to learn how to learn.	40	57	3
11. CAI is basically learning how to play games on the computer.	50	47	3
12. Computers are a waste of students valuable class time.	67*	30	3
13. Computer instruction is too much a rote-learning situation.	33	67*	0
14. The child can better pace his or her own learning with a computer.	67*	27	6
15. Educators should avoid using computers only for drill-and-practice.	40	60*	6
16. A computer can give a child more attention than a teacher can.	47	33	0
17. In a few years the novelty of Computer-Assisted-Instruction (CAI) will wear off, and students will become bored with it.	87*	13	0
18. Low-aptitude students profit more from the use of CAI than either average or high-aptitude students.	40	53	7
19. Computer-based instruction denies students the opportunity to act as teachers, to theorize, to reason with others, and to explain in their own words.	27	63*	10
20. A child will pay more attention to a computer than to a teacher.	33	47	20

***Statistically significant at the .05 level of confidence**

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